

FAST SCR / DIODE and SCR / SCR

INT-A-PAK™ Power Modules

Features

- Fast turn-off thyristor
- Fast recovery diode
- High surge capability
- Electrically isolated baseplate
- 3000 V_{RMS} isolating voltage
- Industrial standard package

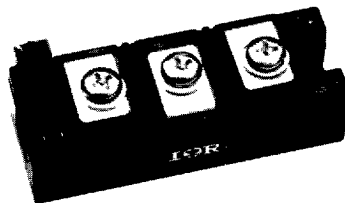
71A

Description

These series of INT-A-pak modules are intended for applications such as self-commutated inverters, DC choppers, electronic welders, induction heating and others where fast switching characteristics are required.

Major Ratings and Characteristics

Parameters	Value	Units
$I_{T(AV)}$	71	A
@ T_C	90	°C
$I_{T(RMS)}$	158	A
I_{TSM} @ 50Hz	2100	A
@ 60Hz	2200	A
I^2_t @ 50Hz	21.6	kA ² s
@ 60Hz	19.8	kA ² s
I^2/t	216	kA ² /s
V_{TM}	2.40	V
V_{RRM}/V_{DRM}	600 to 1200	V
t_q range	18 to 25	μs
t_{rr} (diode)	2 max	μs
T_J	-40 to 125	°C
V_{INS}	3000	V



ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number (*)	Voltage code	V_{RRM} , maximum repetitive peak reverse voltage V	V_{DRM} , maximum repetitive peak off-state voltage V	I_{RRM} I_{DRM} max @ 125°C mA
IRKT/H/L/U/V/K/NF72	06	600	600	30
IRKT/H/L/U/V/K/NF72	08	800	800	30
IRKT/H/L/U/V/K/NF72	10	1000	1000	30
IRKT/H/L/U/V/K/NF72	12	1200	1200	30

(*) Refer to Ordering Information Table to complete Part number

Current Carrying Capacity

Frequency f							Units
50Hz	140	230	220	345	1860	2590	A
400Hz	170	280	250	406	900	1290	A
2500Hz	135	210	210	330	320	470	A
5000Hz	115	180	205	310	205	310	A
10000Hz	85	140	165	235	-	-	A
Recovery voltage Vr	50	50	50	50	50	50	V
Voltage before turn-on Vd	80% V_{DRM}		80% V_{DRM}		80% V_{DRM}		V
Rise of on-state current di/dt	50	50	-	-	-	-	A/µs
Case temperature	90	60	90	60	90	60	°C
Equivalent values for RC circuit	22Ω/0.15 µF		22Ω/0.15 µF		22Ω/0.15 µF		

On-state Conduction

Parameters		Values	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	71	A	180° sinusoidal conduction Max. case temperature $T_c = 90^{\circ}\text{C}$		
$I_{T(RMS)}$	Maximum RMS current	158	A	$T_c = 90^{\circ}\text{C}$, as AC switch		
I_{TSM}	Maximum peak one half cycle non repetitive surge current	2100	A	10ms	No voltage reapplied	Sinusoidal half Wave Initial $T_J = 125^{\circ}\text{C}$
		2200	A	8.3ms		
		1750	A	10ms	100% V_{RRM} reapplied	Sinusoidal half Wave Initial $T_J = 125^{\circ}\text{C}$
		1830	A	8.3ms		
I^2t	Maximum I^2t for fusing	21.6	kA^2s	10ms	No voltage reapplied	Initial $T_J = 125^{\circ}\text{C}$
		19.8	kA^2s	8.3ms		
		15.3	kA^2s	10ms	100% V_{RRM} reapplied	Initial $T_J = 125^{\circ}\text{C}$
		14.0	kA^2s	8.3ms		
I^2/t	Maximum I^2/t for fusing	216	kA^2/s	t=0 to 10ms, no voltage reapplied Initial $T_J = 125^{\circ}\text{C}$		

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On-state Conduction

Parameters	Values	Units	Conditions
V_{TM} Max. peak on-state voltage	2.40	V	$I_T = 350A$ (peak) half sine wave, $T_J = T_{Jmax}$, $t_p = 10ms$
$V_{T(OT)1}$ Low level value of threshold voltage	1.28	V	$T_J = 125^\circ C$ ($16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$)
$V_{T(OT)2}$ High level value of threshold voltage	1.32	V	$T_J = 125^\circ C$ ($\pi \times I_{T(AV)} < I < 20 \times \pi \times I_{T(AV)}$)
r_{t1} Low level value of on-state slope resistance	3.20	m Ω	$T_J = 125^\circ C$ ($16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$)
r_{t2} High level value of on-state slope resistance	3.00	m Ω	$T_J = 125^\circ C$ ($\pi \times I_{T(AV)} < I < 20 \times \pi \times I_{T(AV)}$)
I_H Maximum holding current	600	mA	$T_J = 25^\circ C$, $I_T > 30A$
I_L Latching current	1000	mA	$T_J = 25^\circ C$, $V_A = 12V$, $R_a = 6\Omega$, $I_g = 1A$

Triggering

Parameters	Values	Units	Conditions
P_{GM} Maximum peak gate power	40	W	$f = 50$ Hz, $d\% = 50$
$P_{G(AV)}$ Maximum average gate power	5	W	$T_J = 125^\circ C$, $f = 50$ Hz, $d\% = 50$
I_{GM} Maximum peak gate current	5	A	$T_J = 125^\circ C$, $t_p \leq 5ms$
$-V_{GM}$ Maximum peak negative gate voltage	5	V	$T_J = 125^\circ C$, $t_p \leq 5ms$
V_{GT} Maximum gate voltage required to fire all devices	3	V	$T_J = 25^\circ C$, $V_A = 12V$, $R_a = 6\Omega$
I_{GT} Maximum gate current required to fire all devices	200	mA	$T_J = 25^\circ C$, $V_A = 12V$, $R_a = 6\Omega$
V_{GD} Maximum gate voltage	0.25	V	$T_J = 125^\circ C$, rated V_{DRM} applied
I_{GD} Maximum gate current that will not trigger any device	20	mA	$T_J = 125^\circ C$, rated V_{DRM} applied

Blocking

dv/dt Maximum critical rate of rise of off-state voltage	400	V/ μs	$T_J = 125^\circ C$ linear to $80\% V_{DRM}$ (*)
I_{RRM} I_{DRM} Max. peak reverse and off-state leakage current	30	mA	$T_J = 125^\circ C$ rated V_{DRM} , V_{RRM} applied
V_{INS} RMS isolation voltage	3000	V	50 Hz, circuit to base, $T_J = 25^\circ C$, 1s

(*) Contact factory for other selections

Switching

t_q Maximum turn-off time	P	K	J	μs	$I_T = 350A$, $T_J = 125^\circ C$ - $di/dt = 25 A/\mu s$, $V_R = 50V$ $dv/dt = 50 V/\mu s$ linear to $80\% V_{DRM}$
	18	20	25		
t_{rr} Maximum recovery time	2			μs	$I_T = 350A$, $-di/dt = 25 A/\mu s$, $V_R = 50V$, $T_J = 25^\circ C$
di/dt Max. non-repetitive rate of rise	800			A/ μs	Gate drive 20V, 20 Ω , $t_r \leq 1\mu s$, $V_D = 80\% V_{DRM}$ $T_J = 125^\circ C$

Thermal and Mechanical Specifications

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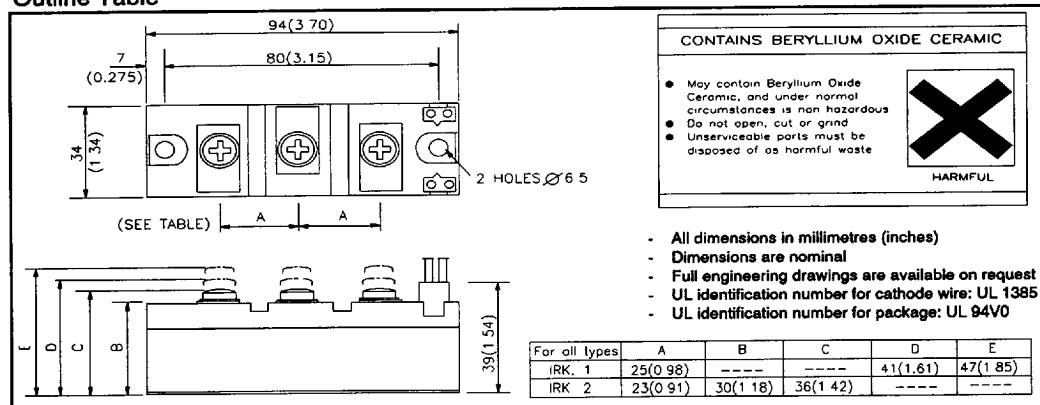
Thermal and Mechanical Specifications				
T _J	Junction temperature range	-40 to 125	°C	
T _{stg}	Storage temperature range	-40 to 150	°C	
R _{thJC}	Internal thermal resistance, junction to case	0.25	K/W	DC operation per junction
R _{thCS}	Thermal resistance case to sink	0.035	K/W	Mounting surface flat and greased - Per module
T	Mounting torque, ±10%	4 to 6	Nm	A mounting compound is recommended. The torque should be rechecked after a period of about 3 hours to allow for the spread of the compound. Use of cable lugs is not recommended, busbars should be used and restrained during tightening. Threads must be lubricated with a compound.
	INT-A-pak to heatsink	35 to 53	lb * in	
	Busbar to INT-A-pak	4 to 6	Nm	
		35 to 53	lb * in	
wt	Approximate weight	500/17.8	g/oz	
	Case style	INT-A-pak		

ΔR Conduction (per Junction)

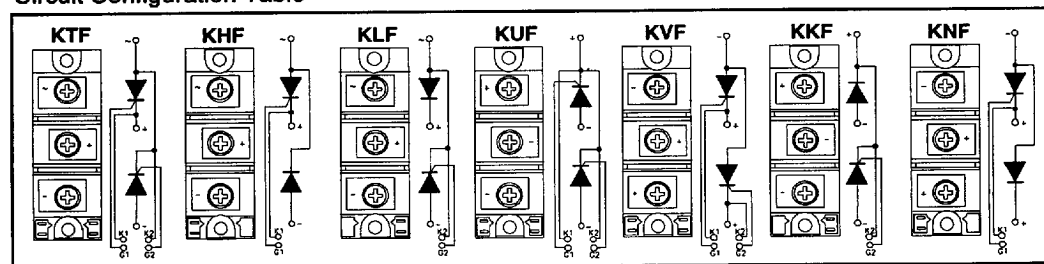
ΔR Conduction (per junction)
(The following table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.016	0.011	K/W	T _J = 125°C
120°	0.019	0.020	K/W	
90°	0.024	0.026	K/W	
60°	0.035	0.037	K/W	
30°	0.060	0.060	K/W	

Outline Table



Circuit Configuration Table



Ordering Information Table

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Device Code

IRK	T	F	7	2	-	12	H	J
1	2	3	4	5	6	7	8	

- 1** - Module type
- 2** - Circuit configuration (See Circuit Configuration Table)
- 3** - Fast SCR
- 4** - Current rating: Code x 10 = $I_{T(AV)}$
- 5** - 1 = option with spacers and longer terminal screws
2 = option with standard terminal screws
- 6** - Voltage code: Code x 100 = V_{RRM}
- 7** - dv/dt code (See table)
- 8** - tq code (See table)

dv/dt
C = 20V/ μ s
D = 50V/ μ s
E = 100V/ μ s
F = 200V/ μ s
G = 300V/ μ s
H = 400V/ μ s

tq
P $\leq$ 18 μ s
K $\leq$ 20 μ s
J $\leq$ 25 μ s

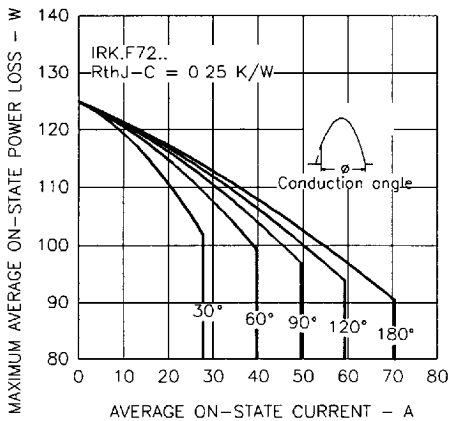


Fig. 1 - Current Ratings Characteristics

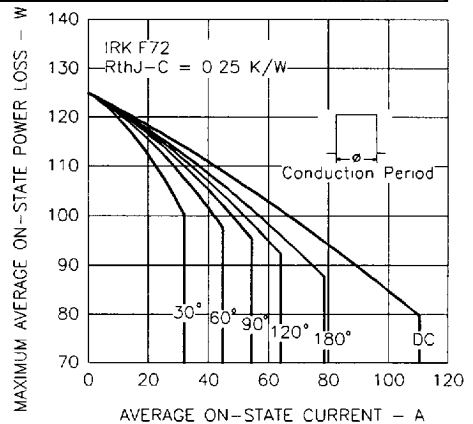


Fig. 2 - Current Ratings Characteristics

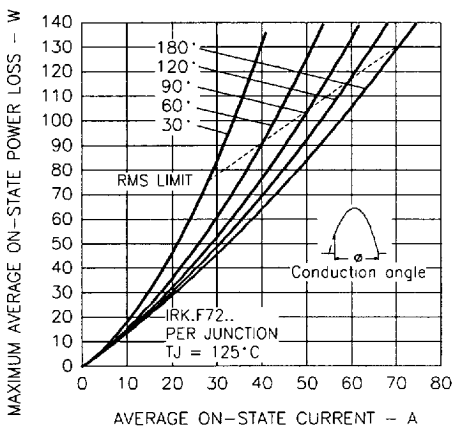


Fig. 3 - On-state Power Loss Characteristics

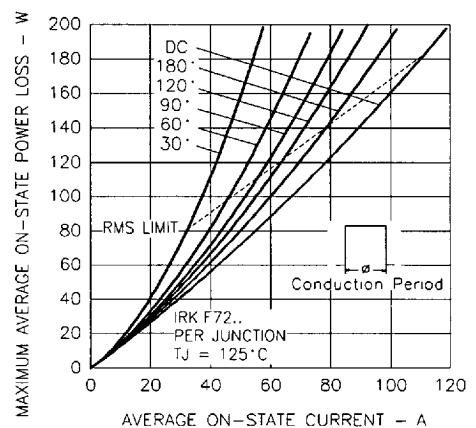


Fig. 4 - On-state Power Loss Characteristics

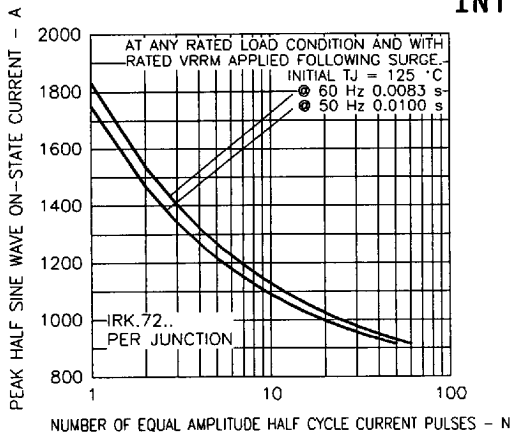


Fig. 5 - Maximum Non-Repetitive Surge Current

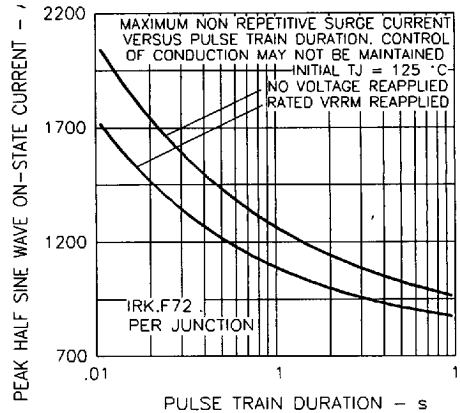


Fig. 6 - Maximum Non-Repetitive Surge Current

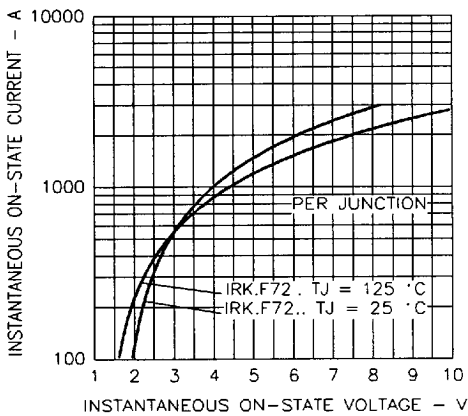


Fig. 7 - On-state Voltage Drop Characteristics

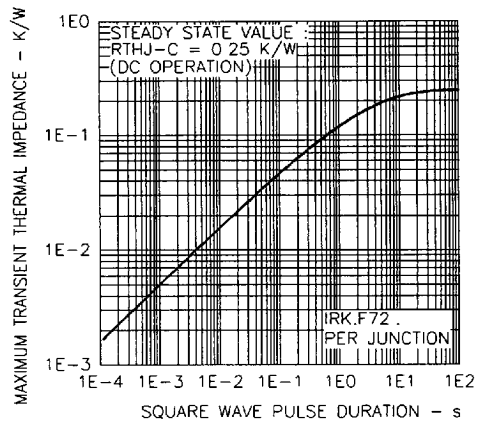
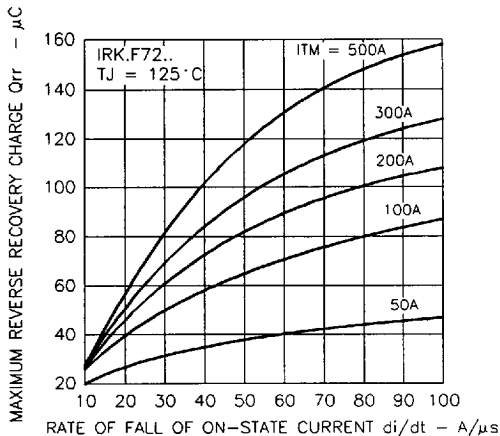
Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

Fig. 9 - Reverse Recovery Charge Characteristics (Thyristor)

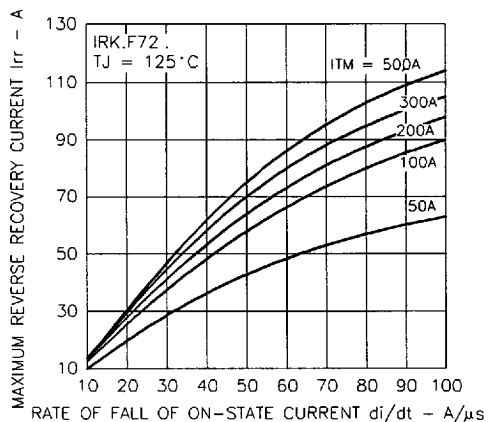


Fig. 10 - Reverse Recovery Current Characteristics (Thyristor)

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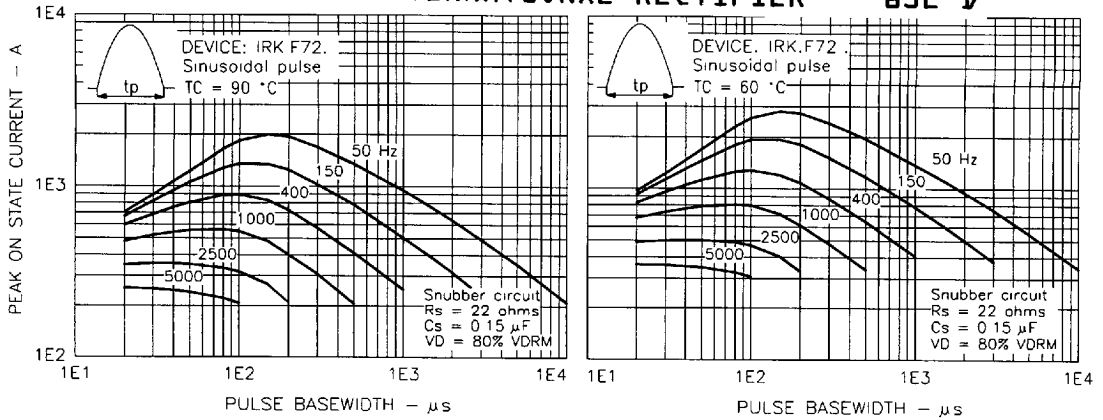


Fig. 11 - Frequency Characteristics

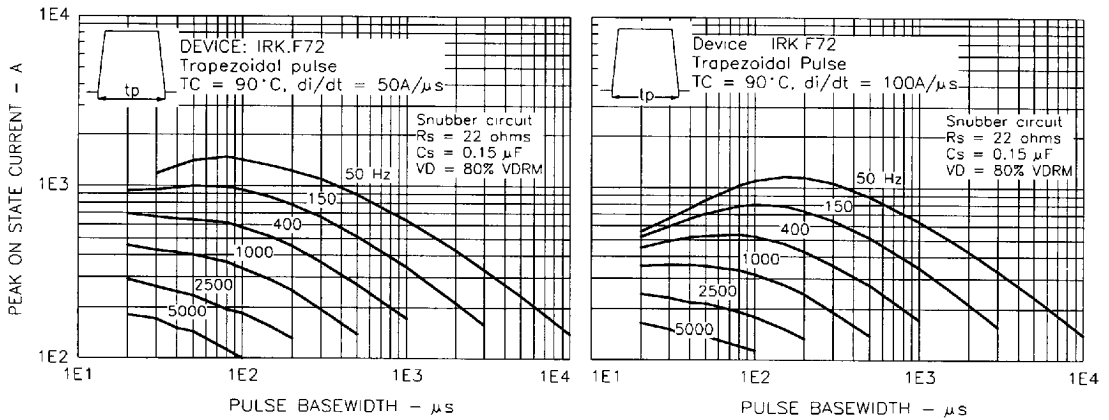


Fig. 12 - Frequency Characteristics

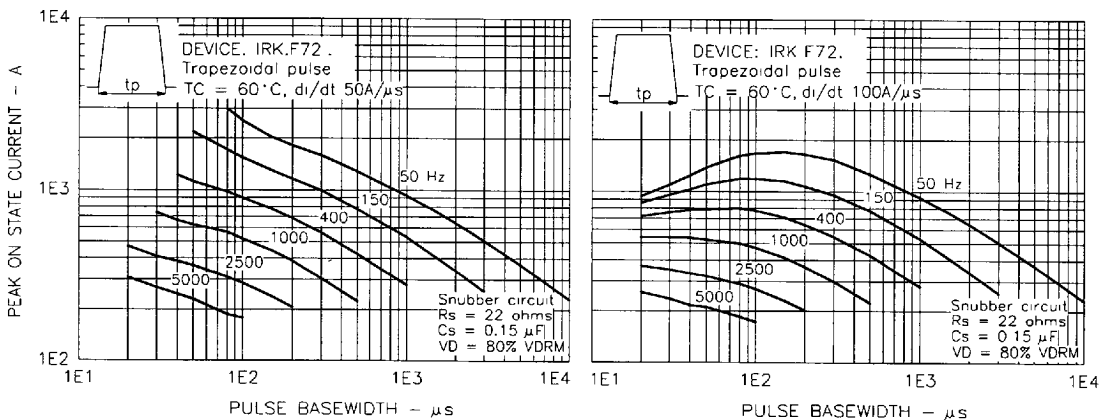


Fig. 13 - Frequency Characteristics

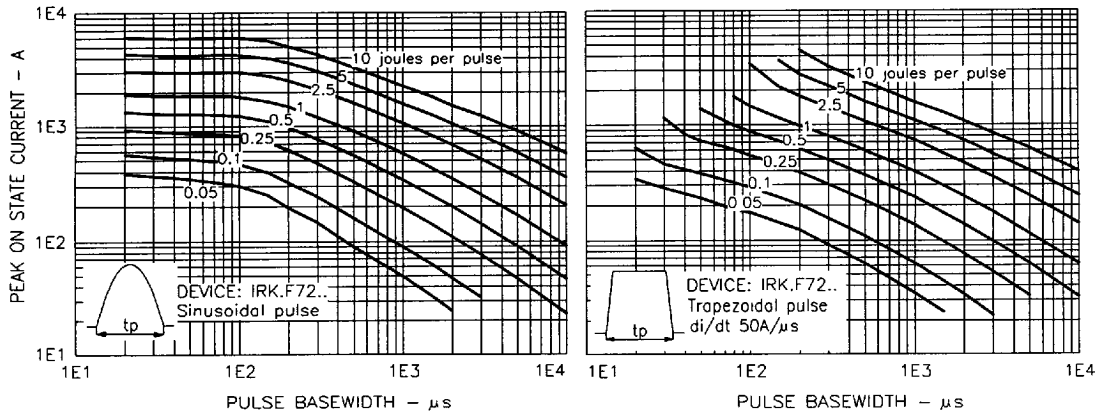


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

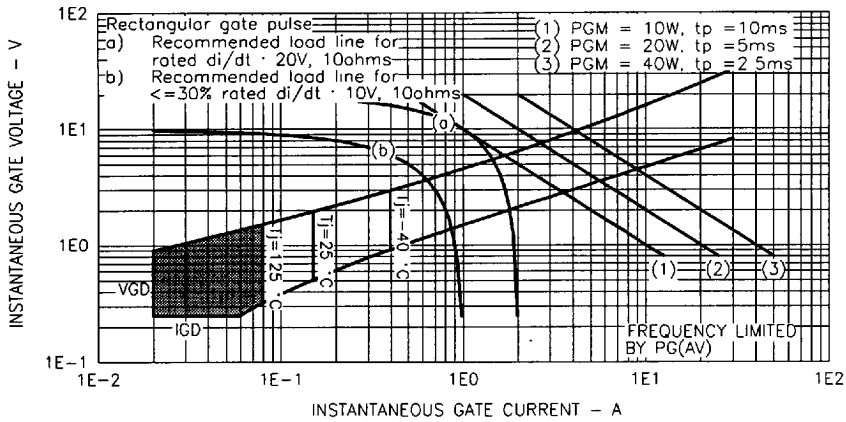


Fig. 15 - Gate Characteristics